SOFTWARE REQUIREMENTS SPECIFICATION
for the
Navy SeaWiFS OCEAN COLOR MODULE (OCM)
Version 1.0

Prepared For:

Remote Sensing Branch
Ocean Sensing and Prediction Division
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13. ABSTRACT *(Maximum 200 words)*

This document identifies the Navy's SeaWiFS OCM software engineering requirements, including operating systems and languages used, and provides an overview of the types of data processed via the levels required to obtain the data products.

14. SUBJECT TERMS

SeaWiFS, TESS, CZCS (Coastal Zone Color Scanner), SeaStar satellite, ocean surface currents, phytoplankton, and ocean optics

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SOFTWARE REQUIREMENTS SPECIFICATION
for the
Navy SeaWiFS OCEAN COLOR MODULE (OCM)

1.0 SCOPE

1.1 Identification

This Software Requirements Specification (SRS) document describes the general functional requirements of the Navy's Sea-viewing Wide Field-of-view Sensor (SeaWiFS) software of the Tactical Environmental Support System [TESS(3)]. This software is an integral part of the Navy's Ocean Color Module (OCM).

1.2 System Overview

The SeaWiFS is the follow-on satellite sensor to the Coastal Zone Color Scanner (CZCS) which was flown on NIMBUS-7 (1978-1986). SeaWiFS will reside on the SeaStar satellite. The sensor was designed by Orbital Sciences Corporation and the National Aeronautics and Space Administration (NASA) to monitor ocean color and provide fast, repeated global and local area coverage required for advanced studies of marine phytoplankton, ocean surface currents, global climate change and ocean optics. Characteristics and descriptions of SeaWiFS major parameters are given in Appendix A (Tables A-1 and A-2).

SeaWiFS data will be broadcast in two modes and in two resolutions. Local Area Coverage (LAC) data will be broadcast at a resolution of 1.1 km; Global Area Coverage (GAC) data will be broadcast at 4.5 km. The Navy SeaWiFS OCM will process only LAC data. The processing occurs through various levels or stages which output L2 corrected data products.

The Navy SeaWiFS OCM software, based on the version 2.0 of NASA's SeaWiFS software (1995), operates on a Concurrent Maxion 9000 system and a HP 9000 system.

1.3 Document Overview

This document identifies the Navy's SeaWiFS OCM software engineering requirements, including operating systems and languages used, and provides an overview of the types of data processed via the levels required to obtain the data products.

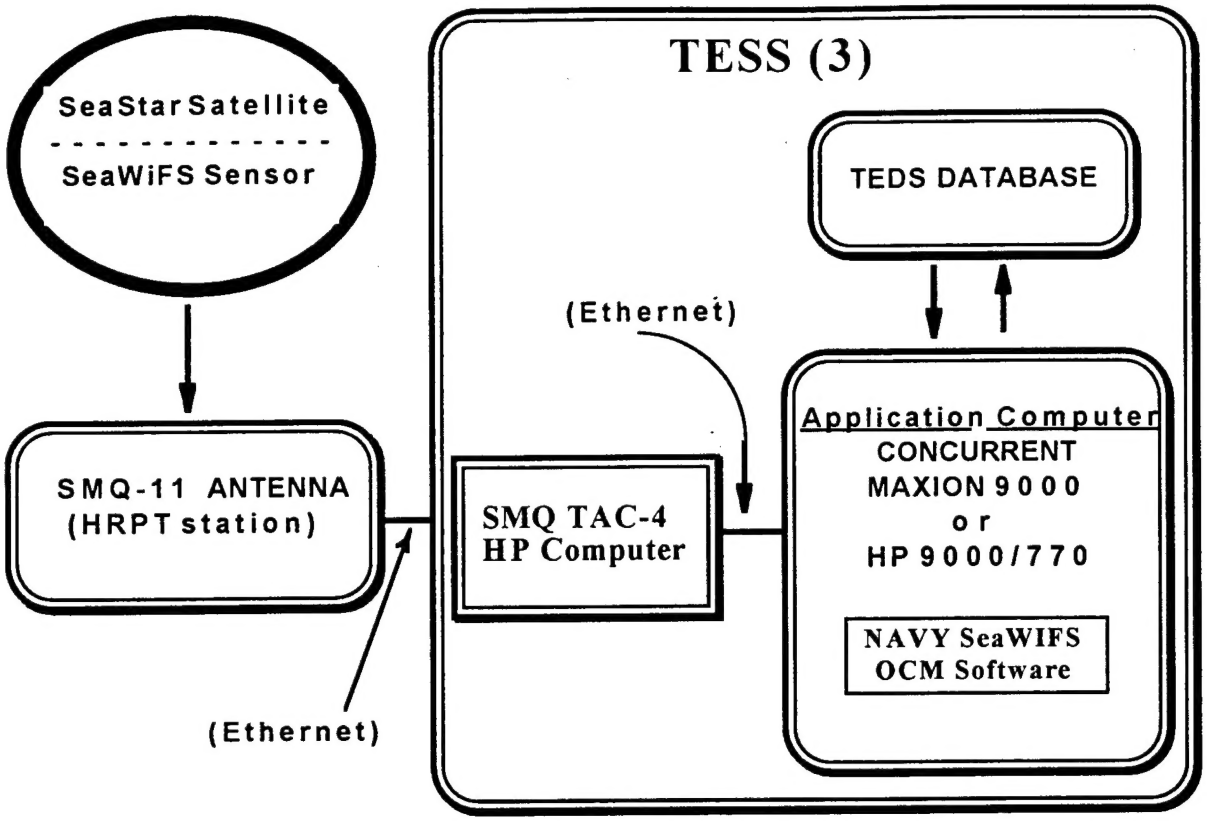


Figure 1. SeaWiFS Data Flow.

2.0 Required States and Modes

Figure 1. above shows the flow-path of the SeaWiFS data once it is received from the sensor. Each part of the overall system-path will be discussed in section 2.3.

3.0 Navy SeaWiFS OCM Capability Requirements

The Navy SeaWiFS OCM processes SeaWiFS data through various stages: Level-0 (L0), Level-1A (L1A) and Level-2 (L2). Figure 2 indicates the data flow for the SeaWiFS processing. The user may display L0, L1A, or L2 products once they have been processed, by executing the NRL-developed display program (SWFDISPLAY). Each level is discussed in follow-on sections.

Level-0	Initial reconstructed and unprocessed instrument/payload data at full resolution obtained from the SeaWiFS sensor.
Level-1A	Reconstructed, unprocessed instrument data at full resolution, including radiometric and geometric calibration coefficients and georeferencing parameters (i.e., platform ephemeris), computed and appended, but not applied to the L0 data.
Level-2	Parameters from L1A data, applied to the L0 data, to derive environmental variables at the same resolution and location. Atmospheric correction parameters, obtained from ancillary SeaWiFS data files, are applied to L1A data.

INPUT FILES

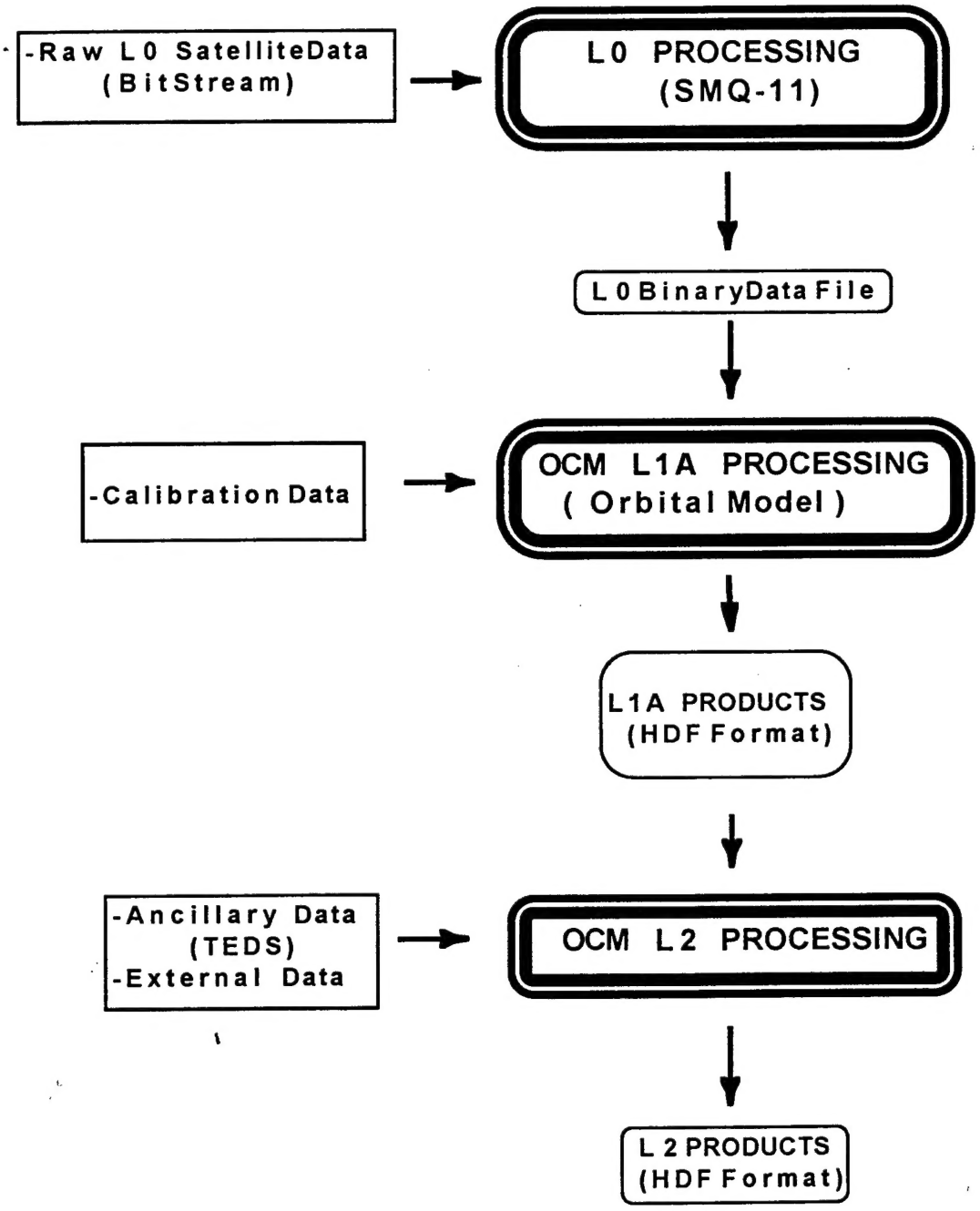


Figure 2. Navy SeaWiFS OCM Data Processing.

3.1 Navy SeaWiFS OCM Data Formats

The Heirarchical Data Format (HDF) is the format used for all final Navy SeaWiFS OCM data products. HDF is a self-defining file format for transfer of various types of data between different computers. The HDF library contains interfaces for storing and retrieving compressed or uncompressed raster images with palettes, and an interface for storing and retrieving n-Dimensional scientific datasets together with information about the data, such as labels, units, formats, and scales for all dimensions. HDF can be downloaded freely from the National Center for Supercomputing Applications (NCSA). The HDF3.3r4 version of the HDF software is required for implementation of the Navy SeaWIFS OCM.

3.2 Navy SeaWiFS OCM Data Requirements, Processing and Products

The sections below describe each stage or level of processing for the SeaWiFS data and detail specific data requirements for data files used as input, the processing of each level and the output data files (products) generated from the processing levels.

3.2.1 Input Data

High Resolution Picture Transmission (HRPT) Data

Raw spacecraft and telemetry data, including data from eight spectral bands, will be directly broadcast in real time from the SeaStar satellite to the SMQ-11 antenna residing at various HRPT stations in the Navy. These data are referred to as HRPT data and are transmitted with a spatial resolution of 1.1 km at nadir (directly beneath the satellite) [SeaWiFS Technical Reports, 1992].

Sensor Calibration Data

Slots are available in the telemetry data stream onboard the spacecraft for calibration tables. These tables are used by the HRPT stations to calibrate SeaWiFS data using the most updated coefficients without requiring access to a different source. Coefficients are uplinked by SeaStar's Operations Ground Subsystems (SOGS) on a routine basis and changes are made to ensure timeliness. Mission Operations submit calibration tables to the SOGS as part of the SeaWiFS overpass schedules and adds the most recent orbital elements to the tables to enable HRPT stations to point antennas using data in the data stream (SeaWiFS Technical Report, 1992).

3.2.2 Level Processing

3.2.2.1 Level-0

The Level-0 data (L0) consists of initial reconstructed and unprocessed instrument/payload data at full resolution that is transmitted from the SeaWiFS satellite to the SMQ-11 antenna residing at HRPT stations (See Figure 2.). The L0 data consist of real-time raw SeaStar Data (including raw radiance counts from eight spectral bands), instrument telemetry, navigation data, and scan-line attributes. The SeaWiFS sensor provides the initial data to begin producing Navy SeaWiFS OCM data products [For detailed descriptions of the L0 products, refer to the Operational Archive Product Specifications (OAPS 1995) document]. The L0 processing is performed by the Hughes Air Warfare Center (HAWC) in Indianapolis, Indiana and then stored for future access. The Navy SeaWIFS OCM is not responsible for any L0 processing and only uses the processed L0 data to begin the SeaWiFS processing in Level-1A.

3.2.2.2 Level-1A

The L1A processing begins the Navy SeaWiFS OCM processing. The L0 data is stored, and radiometric and geometric calibration coefficients and georeferencing parameters are determined. These parameters are computed and appended, but not applied to the L0 data.

L1A data processing calculates calibrated radiances in units of W m^{-2} μm^{-1} sr^{-1} in the eight (8) spectral bands of SeaWiFS. The radiance received at the satellite altitude consists of backscattered solar radiation, scattered by the Earth's atmosphere, ocean, clouds and land. Water-leaving radiance (the signal of interest) generally comprises less than 10% of the total signal. [J. Campbell, 1994]

3.2.2.2.1 Level-1A Data Products

L1A data products are Global Attributes, Scan-Line Attributes, Raw SeaStar Data, Calibration Data, Converted Telemetry Data, Navigation Data, and Sensor Tilt Data (Figure A-2 in Appendix A). These products include individual scans written as separate records. Individual files are written for (1) each recording cycle of recorded data, (2) each view period of real-time direct-broadcast HRPT data, and (3) each set of calibration data. Data are checked for time-order and continuity. Missing scans are filled with flag records that contain zeroes for the image data.

All file-level metadata (scan-line attributes, raw SeaStar data, converted telemetry, and navigation data) are included in the file. Static metadata is included as annotations. The Operational Archive Product Specifications (OAPS) 1995 document details the contents of each of the data fields discussed above.

3.2.2.3 Level-2

3.2.2.3.1 Ancillary Data

Prior to processing of Level-2, **ancillary data** is required to initiate processing. The ancillary data consists of Near Real-Time (NRT) meteorological and ozone data which is used in the atmospheric correction algorithm for producing derived ocean color products. Separate files contain surface value data for

(a) total column ozone,
(b) surface values of zonal (east-west) wind speed,
(c) surface values of meridional (north-south) wind speed,
(d) surface atmospheric pressure, and
(e) relative humidity

These ancillary data files may be obtained from several sources/agencies. The ancillary parameters represent global "snapshots" at frequencies of at least once per day, i.e., NRT. These products are stored in two separate HDF files: one containing the total column ozone and a second file containing the surface values of zonal (east-west) wind speed, surface values of meridional (north-south) wind speed, surface atmospheric pressure, and the relative humidity. See Figure 3 to see how the ancillary data is used during the L2 processing. Figure 4 indicates the sources and processing flow for the ancillary data .

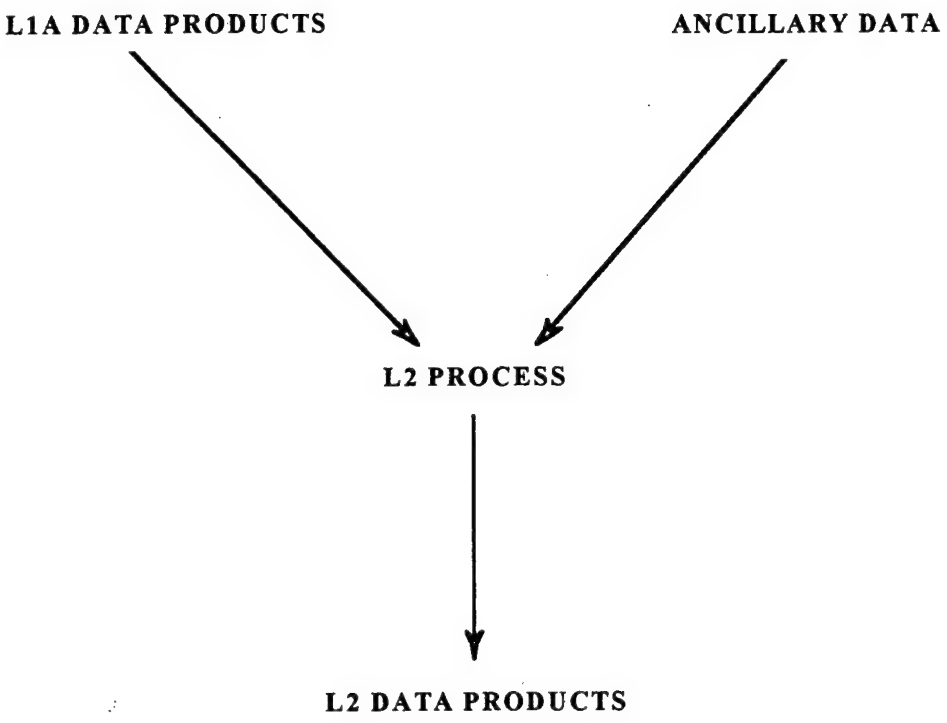


Figure 3. Navy SeaWiFS OCM Ancillary Data Flow for L2 Processing in TESS(3).

GENERATING SEAWIFS ANCILLARY DATA in TESS (3)

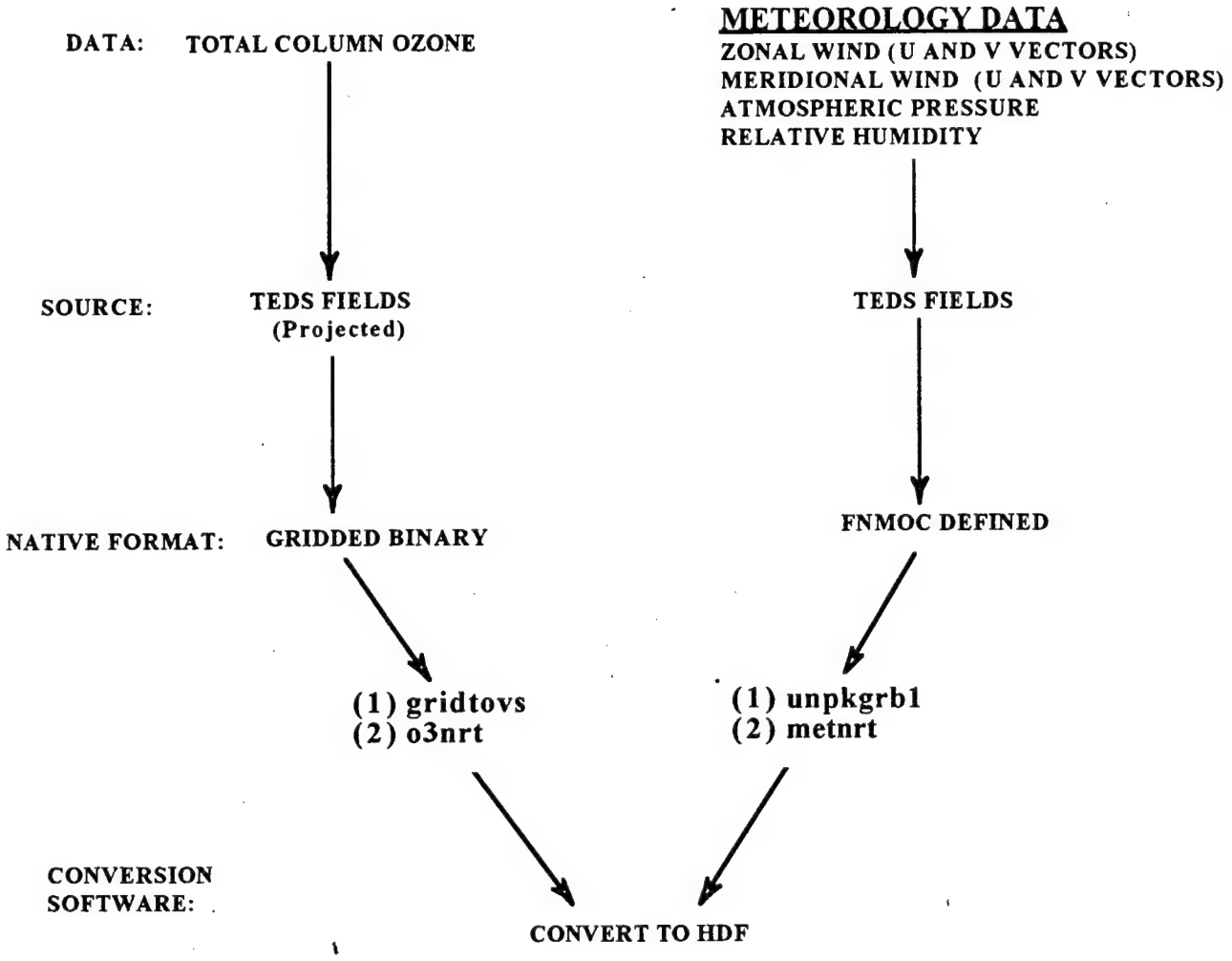


Figure 4. Navy SeaWiFS OCM Data Flow for Generating Ancillary Data in TESS(3).

Meteorological Data - Near Real Time (NRT) meteorological data are available from Fleet Numerical Meteorology and Oceanography Center (FNMOC) fields and then stored in the TEDS database. These fields resemble the National Meteorological Center (NMC) fields. The data is provided in 6-hour increments in a gridded binary (GRIB) format (Stackpole, 1990). The GRIB files are unpacked to simple binary arrays for each of the desired meteorological parameters (zonal and meridonal wind speed, surface pressure, and relative humidity). The binary arrays are then processed to produce HDF data products. (OAPS 1995).

Ozone Data - The total ozone consists of daily ASCII files representing averaged gridded arrays. NOAA's Television Infrared Observations Satellite (TIROS) Operational Vertical Sounder (TOVS) instrument provides twice-daily set of soundings. The ozone fields are computed in TESS but not currently written in TEDS database. This should be available in the future.

3.2.2.3.2 Level 2 Data Products

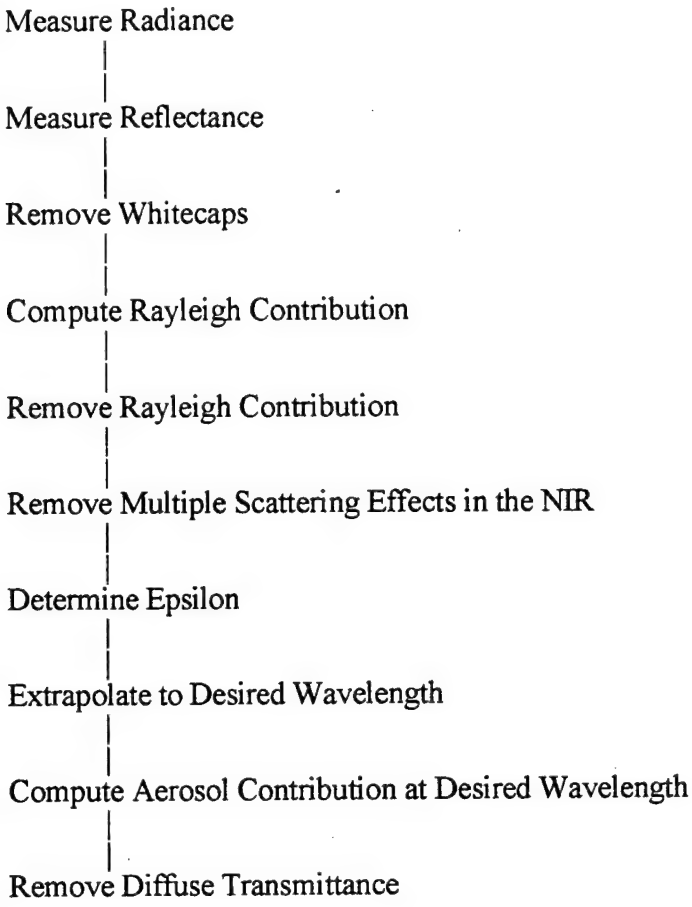
Geophysical properties of the ocean and atmosphere derived from the L1A data are considered L2 data. L2 data corresponds to the original pixel positions. Each L2 scene (digital picture) corresponds to a L1 scene and vice versa. The geographical coverage of each scene for operational products does not change. L2 geophysical parameters include pigment and chlorophyll-*a* concentration, diffuse attenuation coefficient at 490 nm, first five normalized water-leaving radiances, one from each channel, three aerosol radiances, an aerosol optical thickness at 865 nm and a confidence or error field. The following standard variables are computed during the L2 processing:

$nL_w(l_i)$ i= 1,...,5	normalized water-leaving radiances in bands 1-5
$L_a(l_i)$ i= 6,...,8	atmospheric aerosol radiances in bands 6-8
$t_a(865)$	aerosol optical thickness at 865 nm (band 8)
PIG	CZCS-like pigment concentration (mg m^{-3})
CHL	chlorophyll-a concentration (mg m^{-3})
K_{490}	diffuse attenuation coefficient at 490 nm (m^{-1})

Before computing L2 data products, pixels are eliminated if they contain clouds, sun glint, or other abnormalities. An atmospheric correction algorithm (Gordon et al.1983; Gordon and Castano, 1987) is applied to subtract the atmospheric attenuation components from the total radiance, and thus the water-leaving radiances in bands 1-5 are derived. Finally, bio-optical algorithms (Clark, 1981; Gordon and Morel, 1983) are applied to the water-leaving radiances to derive in-water properties [J. Campbell, 1994].

The atmospheric correction is performed on the L1A data products to remove the atmospheric effects, mainly Rayleigh scattering and aerosol scattering, from satellite-received signals. After the application of the atmospheric correction, water-leaving radiances are retrieved (the normalized water-leaving radiance approximates the radiance that would exit the ocean in the absence of the atmosphere with the sun at the zenith) [Yeh, 1994].

A synopsis of the processes involved in the atmospheric correction algorithm is shown below:



The radiance of the ocean-atmosphere system measured at a satellite (L_m) is expressed in the general form as

$$L_m = L_0 + L_{sfc} + L_W \quad .$$

Appendix B describes each of the terms used in this expression in more detail.

L2 data products consist of Global Attributes, Scan-Line Attributes, Geophysical Data, Raw SeaStar Data, Converted Telemetry Data, Navigation Data, and Sensor Tilt Data. The diagram below shows a general flow for performing the atmospheric correction. Figure A-3 in Appendix A shows the Level 2 data products.

4.0 Navy SeaWiFS OCM External Interface Requirements

4.1 Interface Identification and Figures

Raw SeaWiFS data is received at HRPT stations (e.g., aboard ships) via the SMQ-11 antenna and then stored on a HP 9000 computer, the SMQ TAC-4. Data is then sent, via the Ethernet, to the system currently in use, which houses the Navy SeaWiFS OCM software (Concurrent Maxion 9000 or the HP 9000). The L1A data processing is then accessed if desired and respective data products generated. After generating L1A products, the L2 processing is engaged which then performs the necessary atmospheric corrections. Refer to Figure 1 to see this relationship. Components are described next.

4.1.1 SMQ-11 Antenna

The SMQ-11 antenna resides at the HRPT desinated station(s). It receives SeaWiFS satellite data directly to be used in the Navy SeaWiFS OCM software.

4.1.2 Hewlett-Packard (HP) 9000 SMQ TAC-4 computer

The HP SMQ TAC-4 partially processes data once it is received from the SMQ-11 antenna.

4.1.3 Application Computers: Concurrent Maxion 9000 or HP 9000

The Navy SeaWiFS OCM processing software will be stored on the Concurrent Maxion 9000 computer or the HP 9000 computer. For the Concurrent Maxion 9000 computer, the software operates in a 6.2 Real Time UNIX (RTU) operating system environment. For the HP 9000/770 computer, the operating system is the HP-UX Version E.

4.1.4 Tactical Environmental Data System (TEDS) Database

The Tactical Environmental Data System (TEDS) was designed to store, retrieve, and manipulate environmental data and data products, for distribution to other sites, for use with various applications. The TEDS will be used as the main storage facility for the Navy SeaWiFS OCM products.

4.1.5 Communication Network

The Ethernet network is used for transferring data from the HP 9000 SMQ TAC-4 computer to the Concurrent Maxion 9000 computer, to receive/send data to the TEDS database and to receive data from the SMQ-11 antenna at the HP 9000 SMQ TAC-4 computer.

5.0 Navy SeaWIFS OCM Internal Data Requirements

- The L0 data is used to produce the L1A products.
- The L1A products are used to perform the L2 processing.
- The L2 products are stored for display purposes or future use.

Detailed information concerning each product is shown in Figures A-2 and A-3 in Appendix A.

6.0 Security Requirements

Other than the secure communication links required for uploading/downloading data, no other security requirements are necessary for the Navy SeaWiFS OCM software to be operational.

7.0 Computer Resource Requirements

7.1 Computer Hardware Requirements

The NASA SeaWiFS software was originally developed on the Silicon Graphics (SGI) system. The Navy SeaWiFS OCM software can operate on either a Concurrent Maxion 9000 system or a HP 9000 system. The computer systems suggested by NASA for the SeaWiFS processing are the SGI INDY/INDIGO 2 or larger or the SUN Sparc 2 or larger. A minimum memory of 64 MB (preferrably 96 MB) is suggested with a disk storage of 3 GB or more. A graphics display monitor with 1280 x 1024 resolution and a minimum of 8-bit color planes is recommended. Recommended operating systems include (1) the SGI-IRIX 5.3 or higher version or (2) the SUN-Solaris 2.4 or higher version.

7.2 Computer Hardware Resource Use Requirements

The total number of bytes required for storage of the Navy SeaWiFS OCM products is dependent upon several factors. These factors are the number of scan lines and the number of pixels per scan line. The table below indicates the total number of bytes required for storage per scan line for both the L1A and L2 data. The data breakdown is given below the table.

	Imagery Data		Metadata		# Scan Lines		(Approx.) Additional Storage		Total # Bytes Required / Scan Line
L1A	20,560	+	1,577	x	3,426	+	80,000	=	75.92 MB
L2	30,840	+	404	x	3,426	+	100,000	=	107.14 MB

For full-resolution data, each scan-line of L1A data is 1,285 pixels x 8 band values per pixel by 2 bytes per band value = 20,560 bytes. The number of bytes of metadata for each scan line is: Scan-Line Attributes, 72; Raw SeaStar Data, 955; Converted Telemetry, 410; and Navigation, 140. Therefore, each scan line consists of 20,560 bytes of data and 1,577 bytes of metadata, for a total of 22,137 bytes. For each L1A scene or product, approximately 80,000 bytes (80 KB) of additional metadata and HDF overhead will be required.

For L2 data, each scan-line is 1,285 pixels x 11 bands per pixel by 2 bytes per band value plus 1,285 pixels x 2 bands per pixel by 1 bytes per band value = 30,840 bytes. The number of bytes of metadata for each scan line is: Scan-Line Attributes, 40; Raw SeaStar Data, 32; Converted Telemetry, 192; and Navigation, 140. Therefore, each scan line consists of 30,840 bytes of data and 404 bytes of metadata, for a total of 31,244 bytes. For each L2 scene or product, approximately 100,000 bytes (100 KB) of additional metadata and HDF overhead will be required.

7.3 Computer Software Requirements

NASA's version of SeaWiFS used the FORTRAN 77, C and Ratfor/Mice computer languages. The Navy SeaWiFS OCM software also used the FORTRAN 77 and C computer languages. However, the Navy's software utilizes a FORTRAN-translated version of the Ratfor language. Version 3.3r4 of the HDF software is required. The NASA version of the software required three software packages: (1) X Window Motif, (2) Interactive Data Language (IDL) and (3) the Heirarchal Data Format (HDF) Library.

NASA's version of the SeaWiFS processed data via a Graphics User Interface (GUI), written using the IDL software, where menu options and graphics display screens prompted the user for choices. IDL routines are not available within the TESS environment. Therefore, the Navy's SeaWiFS OCM software omitted all IDL-related software concerning the Graphics User Interface (GUI) and display.

The Navy SeaWiFS OCM Level-1A and Level-2 processing occurs in a command-line mode, where the user types a command with its required arguments. To handle the graphics display, the Navy SeaWiFS OCM display program, SWFDISPLAY, was written which displays SeaWiFS OCM processing for Level-0, Level-1A and Level-2 data. The HDF Library was used to develop HDF file interfaces.

8.0 Design and Implementation Constraints

The design and implementation of the Navy SeaWiFS OCM software was based on NASA's SGI version of the software. To implement the SeaWIFS OCM software on the Concurrent Maxion 9000 system first, and then the HP 9000 later, several software portability problems had to be overcome. For further details on the inconsistencies encountered, the Navy's SeaWiFS OCM software developers should be contacted. Points of contact are Sonia Gallegos (NRL/SSC, (601)688-4864) or Chiu-fu Cheng (Lockheed Martin /SSC, (601)688-1708).

Due to the SeaWiFS satellite's launch schedule delay, no real-time SeaWiFS data was available for the Navy SeaWiFS OCM development and testing. Therefore, simulated data, obtained from NASA, were used to test the Navy SeaWiFS OCM software. This simulated data, supplied by NASA, were "static" files (i.e., they did not and could not be changed). Currently, there are no means available to update the ancillary data files or to store or extract data from TEDS. HDF formatted L1A and L2 output files were generated from the simulated data.

Sections 2.6.1 and 2.6.3 identify the Navy's hardware and software requirements, respectively. If these requirements are satisfied, there should be no other constraints incurred in implementing the Navy SeaWiFS OCM software to adaptable platforms.

9.0 Personnel-related Requirements

To successfully operate the Navy SeaWiFS OCM software, typical users should, at a minimum, possess basic computer skills and experience.

10.0 Training-related Requirements

NRL shall provide all required training to perspective Navy SeaWiFS OCM software users.

11.0 Software Delivery Specifications/Requirements

The following Navy SeaWiFS OCM software, test data and documentation shall be delivered via tar files:

(A) Navy SeaWiFS OCM software
1. Main programs
2. Subroutines
3. Scripts
4. Makefiles
5. Graphics/Display program (SWFDISPLAY)

(B) Data files
1. Input files
   (a) Raw data file(s) - Simulated
   (b) Ancillary data (s) - Simulated

2. Output files (from testing)
   (a) L1A HDF file(s)
   (b) L2 HDF file(s)
   (c) Column Ozone Data
   (d) Meteorology Data

(C) Documentation
1. Installation Procedures for all software
2. Pertinent file descriptions

12.0 Precedence and Criticality of Requirements

Since each succesive level of the Navy SeaWiFS OCM processing depends on the previous level's products, the order of processing is very important. The order is (1) L1A data processing, then (2) L2 data processing. The most critical Navy SeaWiFS OCM processing is performed during the L2 data processing, where atmospheric corrections are made to the L1A data.

13.0 REFERENCED DOCUMENTS

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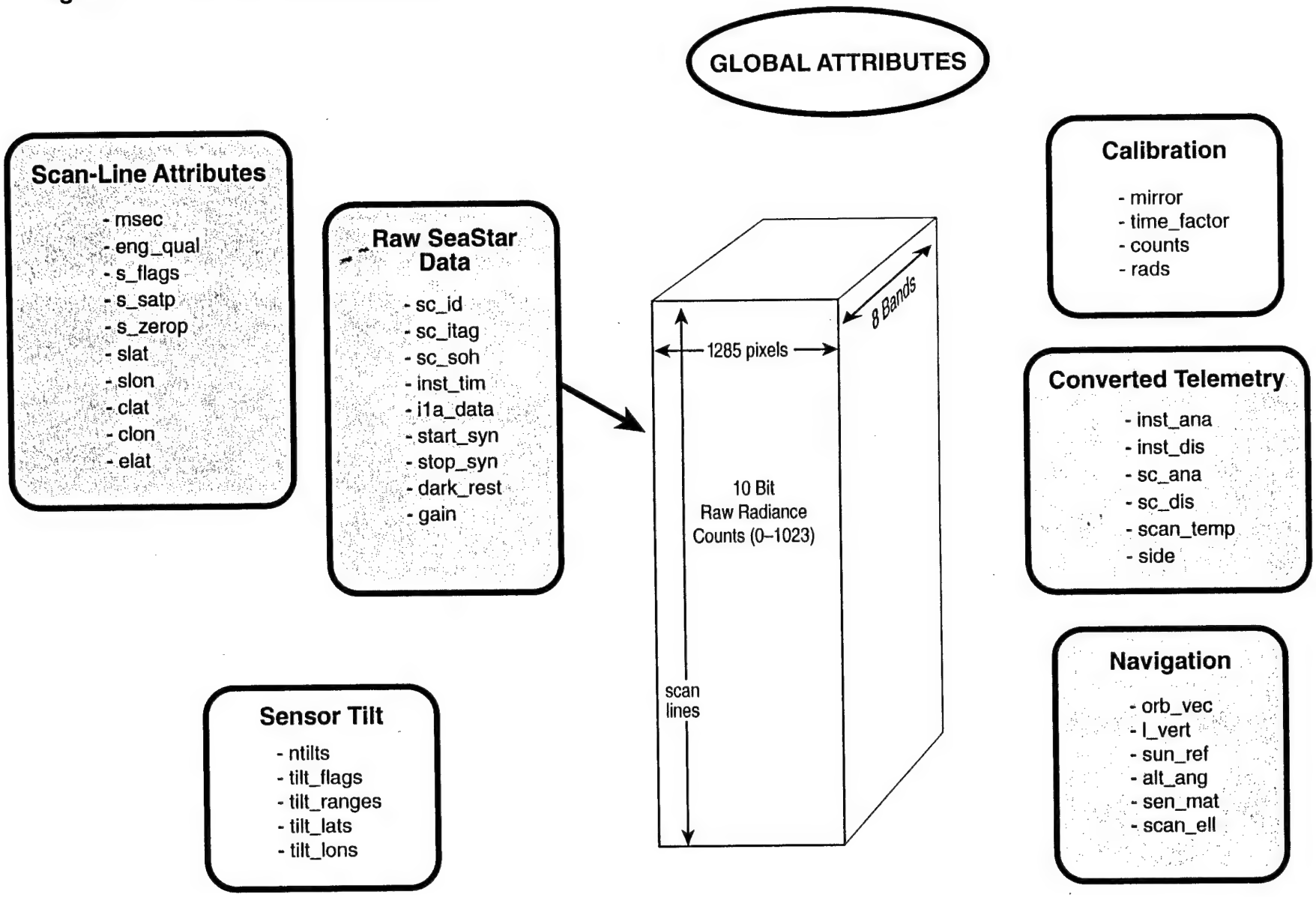
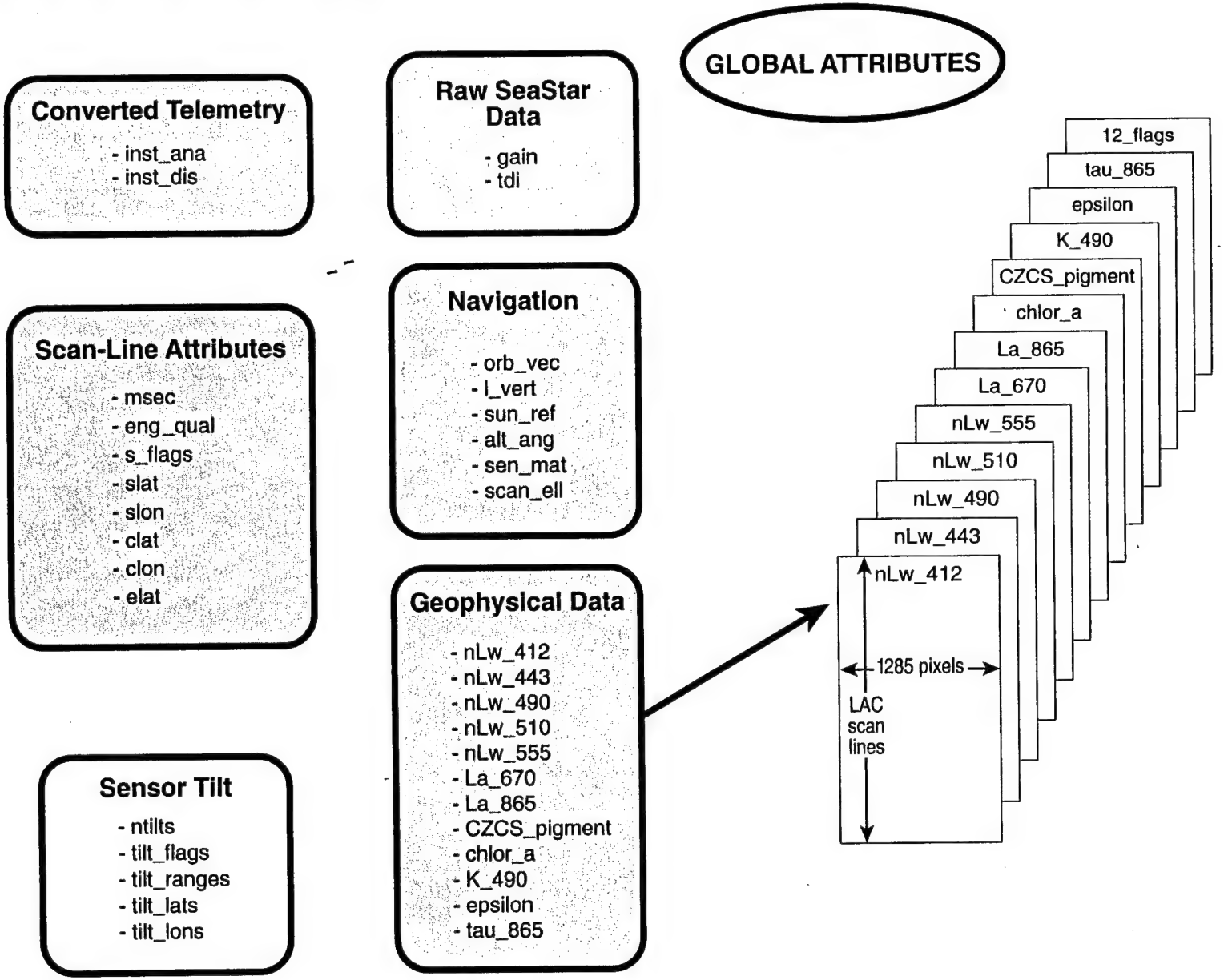
APPENDIX A

Figure A-1. Level 1A Data Products



Shaded objects contain data for each scan line.

Figure A-2 Level 2 Data Products



Shaded objects contain data for each scan line.

Table A-1. Major SeaWiFS Parameters and Characteristics.

Band	Wavelength FWHM[nm]	Saturation Radiance	Input Radiance	SNR	Color	Measurement
1	402-422	13.63	9.10	499	Violet	Dissolved organic matter
2	433-453	13.25	8.41	674	Blue	Chlorophyll (blue absorption)
3	480-500	10.50	6.56	667	Blue/Green	Chlorophyll (blue/green absorption)
4	500-520	9.08	5.44	616	Green	Chlorophyll (green absorption)
5	545-565	7.44	4.45	581	Green/Yellow	Chlorophyll (green reflection)
6	660-680	4.20	2.60	447	Red	Atmospheric Aerosols
7	745-785	3.00	1.61	455	Red	Atmospheric Aerosols
8	845-885	2.13	1.09	467	Red	Atmospheric Aerosols

Table A-2.

Sensor Accuracy

Radiance Accuracy :	< 5% absolute each band
Band Registration:	< 0.3 pixel
Saturation Recovery:	10 pixels
Polarization:	< 2% (<1% expected)
Nadir Resolution:	1.1 km LAC; 4.5 km GAC

Mission Characteristics

Orbit Type:	Sun Synchronous at 705 km
Equator Crossing:	Noon +- 20 min., descending
Duty Cycle:	100% daylight
Swath width:	2,800 km LAC (+-58.3 degrees)
Swath width (at equator):	1,502 km GAC (+-45.0 degrees)
Scan Plane Tilt:	+20 degress, 0 degrees, -20 degrees)
Dynamic Range:	10 bits quantization; 4 gains

APPENDIX B

Details of Atmospheric Correction Algorithm (L2 Processing)

The atmospheric correction is performed on the L1A data products to remove the atmospheric effects, mainly Rayleigh scattering and aerosol scattering, from satellite-received signals, and water-leaving radiances are retrieved (the normalized water-leaving radiance approximates the radiance that would exit the ocean in the absence of the atmosphere with the sun at the zenith) [Yeh, 1994].

The radiance of the ocean-atmosphere system measured at a satellite (L_m) is expressed as

$$L_m = L_0 (\lambda; \theta, \phi ; \theta_0 , \phi_0 ; \tau_a)$$

$$+ L_{sfc} (\lambda; \theta, \phi ; \theta_0 , \phi_0 ; \nu ; \tau_a)$$

$$+ L_W (\lambda; \theta, \phi ; \theta_0 , \phi_0 ; W ; \tau_a ; C) t'' (\lambda ; \theta ; \tau_a) ,$$

where
- L_0 represents the radiance of the atmosphere, if the radiance just above the sea surface is zero;
- L_{sfc} represents the radiance of the light reflected from the surface; and
- L_W represents the water-leaving radiance of light scattered from beneath the surface and penetrating it.

All four radiances are vectors representing the four Stokes parameters, in order to account for the polarization properties of the scattered light. L_W contains the information about the sea particles and absorbing species, e.g., chlorophyll and pigments; t and t' are the transmissions through the atmosphere of L_{sfc} and L_W, respectively. The independent parameters are

λ	Wavelength
θ, ϕ	Polar and Azimuth angles of the line-of-sight at a spacecraft
θ_0 , ϕ_0	Polar and Azimuth angles of the direct sunlight
W	Surface Windspeed
t_a	Aerosol Optical Thickness
C	Chlorophyll Concentration .

APPENDIX C

NOTES / GLOSSARY

CHL	Chlorophyll-a concentration (mg m^{-3})
CSCI	Computer Software Configuration Item
CZCS	Coastal Zone Color Scanner
EP	Earth Probes
FNMOC	Fleet Numerical Meteorology and Oceanography Center
GAC	Global Area Coverage
GB	Gigabytes
GRIB	Gridded Binary Format
GSFC	Goddard Space Flight Center
HDF	Hierarchical Data Format
HRPT	High Resolution Picture Transmission
HAWC	Hughes Air Warfare Center
K490	Diffuse attenuation coefficient 490 nm (m^{-1})
Km	Kilometers
L0	Level 0 data processing
L1A	Level 1A data processing
L2	Level 2 data processing
MB	Megabytes
NASA	National Aeronautics and Space Administration
NCSA	National Center for Supercomputing Applications
NIR	Near-Infrared
NMC	National Meteorological Center
NOAA	Naval Oceanographic Atmospheric Administration
NRL	Naval Research Laboratory
NRT	Near Real-Time

OAPS	Operational Archive Product Specifications
OCM	Ocean Color Module
RDBMS	Relational Database Management System
SeaDAS	SeaWiFS Data Analysis System
SeaStar	NASA Satellite used to transport the SeaWiFS
SeaWiFS	Sea-viewing Wide Field-of-view Sensor
SGI	Silicon Graphics
SMQ-11	High Resolution Picture Transmission Station Antenna
SMQ TAC-4	Hewlett Packard 9000 computer used to perform partial data processing
SOGS	SeaStar's Operations Groung Subsystems
SRS	Software Requirements Specification
SSC	Stennis Space Center
SSD	Scientific Systems Department
TEDS	Tactical Environmental Data System
TESS	Tactical Environmental Support System
TOVS	TIROS Operational Vertical Sounder
TIROS	Television Infrared Observations Satellite